

<b>NOTICE OF REVISION (NOR)</b>		1. DATE (YYMMDD) 96-07-10		Form Approved OMB No. 0704-0188			
THIS REVISION DESCRIBED BELOW HAS BEEN AUTHORIZED FOR THE DOCUMENT LISTED.							
<small>Public reporting burden for this collection is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. PLEASE DO NOT RETURN YOUR COMPLETED FORM TO EITHER OF THESE ADDRESSED. RETURN COMPLETED FORM TO THE GOVERNMENT ISSUING CONTRACTING OFFICER FOR THE CONTRACT/ PROCURING ACTIVITY NUMBER LISTED IN ITEM 2 OF THIS FORM.</small>					2. PROCURING ACTIVITY NO.		
					3. DODAAC		
4. ORIGINATOR		b. ADDRESS ( <i>Street, City, State, Zip Code</i> ) Defense Electronics Supply Center 1507 Wilmington Pike Dayton, OH 45444-5765		5. CAGE CODE 67268			
a. TYPED NAME ( <i>First, Middle Initial, Last</i> )				7. CAGE CODE 67268			
				6. NOR NO. 5962-R177-96			
				8. DOCUMENT NO. <b>5962-86887</b>			
9. TITLE OF DOCUMENT MICROCIRCUIT, LINEAR, LOW NOISE OPERATIONAL AMPLIFIER, MONOLITHIC SILICON			10. REVISION LETTER		11. ECP NO.  N/A		
			a. CURRENT	b. NEW A			
12. CONFIGURATION ITEM (OR SYSTEM) TO WHICH ECP APPLIES All							
13. DESCRIPTION OF REVISION  Sheet 1: Revisions ltr column; add "A". Revisions description column; add "Changes in accordance with NOR 5962-R117-96". Revisions date column; add "96-07-10". Revision level block; add "A". Rev status of pages; for page 1, add "A".  On page 1, at the bottom of the open area between the revision information and the REV status block add "CURRENT CAGE CODE 67268".							
14. THIS SECTION FOR GOVERNMENT USE ONLY							
a. ( <i>X one</i> )		<input checked="checked" type="checkbox"/> (1) Existing document supplemented by the NOR may be used in manufacture. <input type="checkbox"/> (2) Revised document must be received before manufacturer may incorporate this change. <input type="checkbox"/> (3) Custodian of master document shall make above revision and furnish revised document.					
						X	
b. ACTIVITY AUTHORIZED TO APPROVE CHANGE FOR GOVERNMENT  DESC-ELD			c. TYPED NAME ( <i>First, Middle Initial, Last</i> )  Michael A. Frye				
d. TITLE  Chief, Microelectronics Branch		e. SIGNATURE  Michael A. Frye		f. DATE SIGNED (YYMMDD) 96-07-10			
15a. ACTIVITY ACCOMPLISHING REVISION  DESC-ELD		b. REVISION COMPLETED ( <i>Signature</i> )  Rajesh Pithadia		c. DATE SIGNED (YYMMDD) 96-07-10			



## 1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

<u>5962-86887</u>	<u>01</u>	<u>C</u>	<u>X</u>
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type. The device type shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	OP-227A	Dual, low-offset, low noise operational amplifier

1.2.2 Case outline. The case outline shall be as designated in appendix C of MIL-M-38510, and as follows:

<u>Outline letter</u>	<u>Case outline</u>
C	D-1 (14-lead, 1/4" x 3/4"), dual-in-line package

1.3 Absolute maximum ratings. 1/

Supply voltage ( $V_{CC}$ )	±22 V dc
Input voltage range ( $V_{IN}$ )	±22 V dc
Output short circuit duration	Indefinite
Differential input current 2/	±25 mA
Differential input voltage range	±0.7 V dc
Lead temperature (soldering, 60 seconds)	+300° C
Storage temperature range ( $T_J$ )	-65° C to +150° C
Maximum power dissipation ( $P_D$ )	500 mW 3/
Thermal resistance, junction-to-case ( $\theta_{JC}$ )	See MIL-M-38510, appendix C

1.4 Recommended operating conditions.

Supply voltage ( $V_{CC}$ )	±4.5 V dc to ±18 V dc
Ambient operating temperature range	-55° C to +125° C

1/ Unless otherwise specified, all voltages are referenced to ground.

2/ The inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds ±0.7 V, the input current should be limited to 25 mA.

3/ For  $T_A$  greater than 106° C, derate linearly at 11.3 mW/° C.

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## 2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

### SPECIFICATION

#### MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

### STANDARD

#### MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

## 3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections and logic diagram. The terminal connections and logic diagram shall be as specified on figure 1.

3.2.2 Case outline. The case outline shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full recommended ambient operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.4 herein.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ $\pm V_S = \pm 15\text{ V}$ (unless otherwise specified)	Group A subgroups	Limits		Unit
				Min	Max	
Input offset voltage	$V_{IO}$		1		80	$\mu\text{V}$
			2, 3		180	
Input offset current	$I_{IO}$		1		35	nA
			2, 3		50	
Input bias current	$I_{IB}$		1		40	
			2, 3		60	
Average input offset drift 1/	$TC V_{IO}$		1, 2, 3		1.0	$\mu\text{V}/^{\circ}\text{C}$
Power supply rejection ratio	PSRR	$V_S = \pm 4$ to $\pm 18\text{ V}$	1		10	$\mu\text{V}/\text{V}$
			2, 3		16	
Common mode rejection ratio	CMRR	$V_{CM} = \pm 11\text{ V}$	1	114		dB
		$V_{CM} = \pm 10\text{ V}$	2, 3	108		
Large signal voltage gain	$A_{VOL}$	$V_O = \pm 10\text{ V}; R_L \geq 2\text{ kilohms}$	4	1000		V/mV
			5, 6	600		
		$V_O = \pm 10\text{ V}; R_L \geq 600\text{ ohms}$	4	800		
Input voltage range	IVR	$T_A = 25^{\circ}\text{C}$	1	$\pm 11.0$		V
		$T_A = -55^{\circ}\text{C}, +125^{\circ}\text{C}$ 1/	2, 3	$\pm 10.0$		
Output voltage swing	$V_{OP}$	$R_L \geq 2\text{ kilohms}$	4	$\pm 12$		
			5, 6	$\pm 11.5$		
		$R_L \geq 600\text{ ohms}$	4	$\pm 10$		
Slew rate	SR		$R_L \geq 2\text{ kilohms}$	7	1.7	V/ $\mu\text{s}$
Input noise voltage density	$E_n$	$T_A = 25^{\circ}\text{C}$	$f_o = 10\text{ Hz}$	7		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$
			$f_o = 1,000\text{ Hz}$			

See footnote at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ -55° C ≤ T <sub>A</sub> ≤ +125° C ±V <sub>S</sub> = ±15 V (unless otherwise specified)	Group A subgroups	Limits		Unit
				Min	Max	
Input noise current density	I <sub>n</sub>	f <sub>o</sub> = 10 Hz, T <sub>A</sub> = 25° C	7		5.66	$\frac{\text{pA}}{\sqrt{\text{Hz}}}$
		f <sub>o</sub> = 1,000 Hz, T <sub>A</sub> = 25° C			0.99	
Gain-bandwidth product 1/	GBW	f = 100 kHz, T <sub>A</sub> = 25° C	4	5.0		MHz
Power consumption	P <sub>D</sub>	Each amplifier, T <sub>A</sub> = 25° C	1		140	mW
Input offset voltage match	V <sub>OS</sub>	T <sub>A</sub> = 25° C	1		80	μV
		T <sub>A</sub> = -55° C, +125° C	2, 3		180	
Average noninverting bias current	I <sub>B+</sub>	$I_{B+} = \frac{I_{B+A} + I_{B+B}}{2}$	T <sub>A</sub> = 25° C	1		nA
			T <sub>A</sub> = -55° C, T <sub>A</sub> = 125° C	2, 3		
Noninverting offset current	I <sub>OS+</sub>	$I_{OS+} = I_{B+A} - I_{B+B}$	T <sub>A</sub> = 25° C	1		±60
			T <sub>A</sub> = -55° C, T <sub>A</sub> = 125° C	2, 3		±90
Inverting offset current	I <sub>OS-</sub>	$I_{OS-} = I_{B-A} - I_{B-B}$	T <sub>A</sub> = 25° C	1		±60
			T <sub>A</sub> = -55° C, T <sub>A</sub> = 125° C	2, 3		±90

1/ Guaranteed if not tested.

3.5 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

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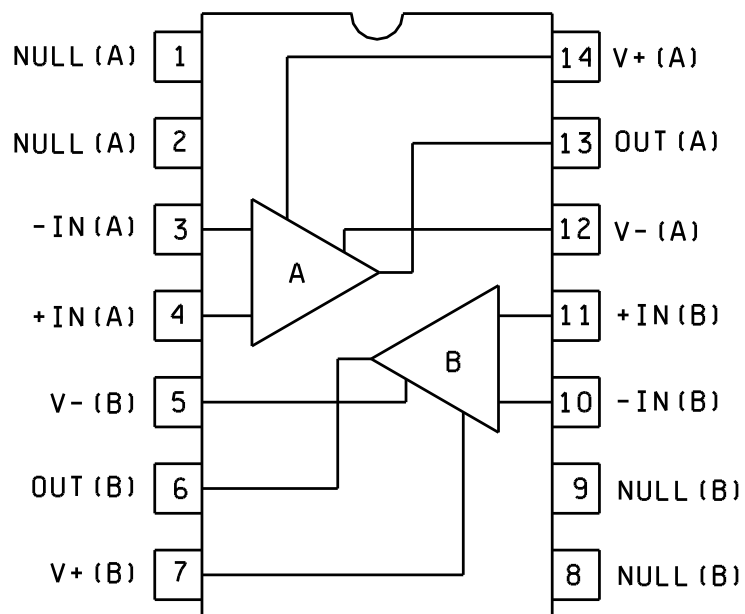


FIGURE 1. Terminal connections and logic diagram. (top view)

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3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test (method 1015 of MIL-STD-883).

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2)  $T_A = +125^{\circ}\text{C}$ , minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

##### 4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

##### 4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test (method 1005 of MIL-STD-883) conditions:

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2)  $T_A = +125^{\circ}\text{C}$ , minimum.

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 4
Group A test requirements (method 5005)	1, 2, 3, 4, 5, 6, 7
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3
Additional electrical subgroups for group C periodic inspections	---

\* PDA applies to subgroup 1.

## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

## 6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Replaceability is determined as follows:

- a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/13504BCX.

6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

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6.4 Approved source of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor 1/ similar part number	Replacement military specification part number
5962-8688701CX	64155 54186 06665	OP-227AJ/883B MP OP-227AY OP-227A883	M38510/13504BCX

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE  
number

Vendor name  
and address

64155

Linear Technology, Inc.  
1630 McCarthy Blvd.  
Milpitas, CA 95035-7487

54186

Micro Power Systems, Inc.  
3100 Alfred Street  
Santa Clara, CA 95050-3674

06665

Precision Monolithic, Inc.  
1500 Space Park Drive  
P.O. Box 58020  
Santa Clara, CA 95050

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